The ECOTOXicology Knowledgebase Literature Search and Review Processes for Identifying and Curating Toxicity Data for Ecological Risk Assessments

Jennifer H. Olker

U.S. EPA ORD/CCTE/GLTED

Duluth, MN

The views expressed in this presentation are those of the authors and do not necessarily reflect the views or policies of the U.S. EPA.

Outline

- Background and History of the ECOTOX Knowledgebase
- ECOTOX Pipeline: Literature Search, Systematic Review, and Data Curation
- Applications and Tools using Data from ECOTOX
- Summary

The Challenge

- Risk assessors needed a cost-effective means of locating relevant ecological toxicity data for:
  - Prioritizing chemical cleanup at hazardous waste sites
  - Assisting in the assessment of potential hazards of pollutants through the Clean Air Act, the Clean Water Act, the Federal Insecticide, Fungicide and Rodenticide Act and the Toxic Substances Control Act.
- Data must be identified with transparent processes and be accessible
- Duplicative efforts for data gathering wastes resources across state and federal agencies

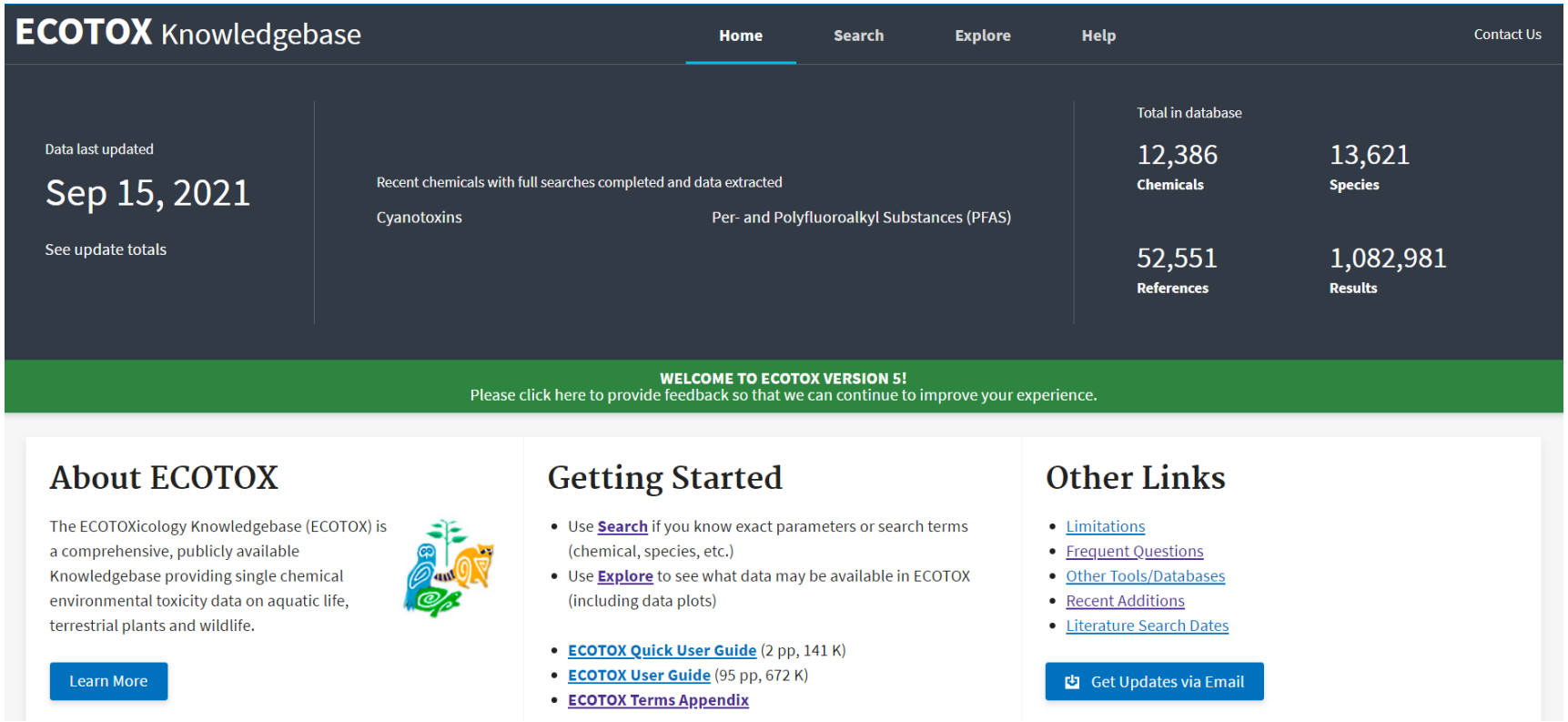
The On-going Challenge and Opportunities

- The accelerated pace of chemical risk assessment for ecological receptors
- Discovery of “new” chemicals of ecotoxicological concern
- Increase in number and diversity of journals
- Changing landscape of toxicity data used for ERA
- Decreasing dependency of traditional whole animal testing for ERA

- Tool development to:
  - Expedite information gathering of information
  - Rapidly sort through BROAD keyword searches (e.g., chemical name)
- Digital formats of journals allow for use of data analytic applications
- Shift from apical endpoints to NAMs requires transparent development of controlled vocabulary for systematic data curation
- Providing a means to take full advantage of existing data before conducting new toxicity studies

What is the ECOTOXicology Knowledgebase?

- 30+ years of curating single chemical toxicity effects data for aquatic and terrestrial organisms
- Systematic and transparent literature search and review of open and grey literature
- >1 million test results from >52,000 references



www.epa.gov/ecotox

ECOTOX Data Curation Pipeline

Chemical verification & development of search terms → **Conduct literature searches** → **Identify and acquire potentially applicable studies** → **Review literature for applicability** → **Extract study and toxicity data**

ECOTOX Data Curation Pipeline

- Verify CASRN
- Search various sources for chemical term
- Synonyms
- Eliminate poor search terms

Tak(Acilid OR Albrass OR Bexton OR "CP 31393" OR "Kartex A" OR Muharicid OR Niticid OR Propachlor OR Propachlore OR Ramrod OR Satecid OR "US EPA PC Code 019101")

*** Web-based tool to identify and document relevant search terms**

ECOTOX Data Curation Pipeline

- Verify CASRN
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Tak(Acilid OR Albrass OR Bexton OR "CP 31393" OR "Kartex A" OR Muharicid OR Niticid OR Propachlor OR Propachlore OR Ramrod OR Satecid OR "US EPA PC Code 019101")

Chemical-based Literature Searches

Search Engines

1. Scopus/Science Direct
2. ProQuest
3. Web of Science
4. PubAg/AGRICOLA
5. PubMed Toxline/TOXNET
6. Dissertation Abstracts

*** Semi-automated batch searches with Abstract Sifter Plus**

ECOTOX Data Curation Pipeline

Chemical verification & development of search terms

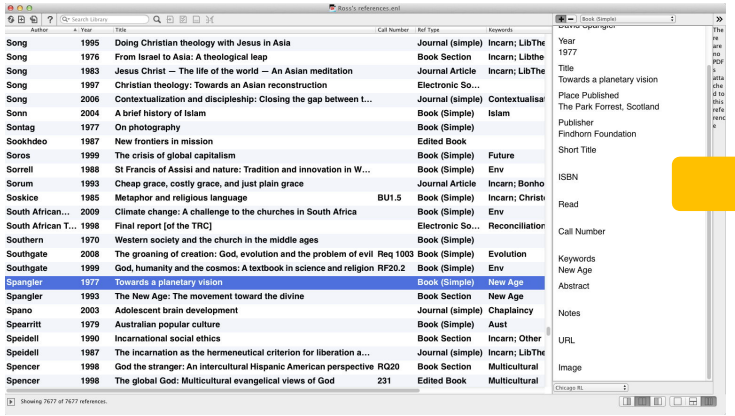
Conduct literature searches

Identify and acquire potentially applicable studies

Review literature for applicability

Extract study and toxicity data

Literature Search Results



Author	Year	Title	Call Number	Ref Type	Keywords
Song	1995	Doing Christian theology with Jesus in Asia		Journal (simple)	Incarn; LibThe
Song	1976	From Israel to Asia: A theological leap		Book Section	Incarn; Libthe
Song	1983	Jesus Christ — The life of the world — An Asian meditation		Journal Article	Incarn; LibThe
Song	1997	Christian theology: Towards an Asian reconstruction		Electronic So…	
Song	2006	Contextualization and discipleship: Closing the gap between t…		Journal (simple)	Contextualisa
Sonn	2004	A brief history of Islam		Book (Simple)	Islam
Sontag	1977	On photography		Book (Simple)	
Sookhdeo	1987	New frontiers in mission		Edited Book	
Soros	1999	The crisis of global capitalism		Book (Simple)	Future
Sorrell	1988	St Francis of Assisi and nature: Tradition and innovation in W…		Book (Simple)	Env
Sorum	1993	Cheap grace, costly grace, and just plain grace		Journal Article	Incarn; Bonho
Soskice	1985	Metaphor and religious language	BU1.5	Book (Simple)	Incarn; Christ
South African…	2009	Climate change: A challenge to the churches in South Africa		Book (Simple)	Env
South African T…	1998	Final report [of the TRC]		Electronic So…	Reconciliation
Southern	1970	Western society and the church in the middle ages		Book (Simple)	
Southgate	2008	The groaning of creation: God, evolution and the problem of evil	Req 1003	Book (Simple)	Evolution
Southgate	1999	God, humanity and the cosmos: A textbook in science and religion	RF20.2	Book (Simple)	Env
Spangler	1977	Towards a planetary vision		Book (Simple)	New Age
Spangler	1993	The New Age: The movement toward the divine		Book Section	New Age
Spano	2003	Adolescent brain development		Journal (simple)	Chaplaincy
Spearritt	1979	Australian popular culture		Book (Simple)	Aust
Speidell	1990	Incarnational social ethics		Book Section	Incarn; Other
Speidell	1987	The incarnation as the hermeneutical criterion for liberation a…		Journal (simple)	Incarn; LibThe
Spencer	1998	God the stranger: An intercultural Hispanic American perspective	RQ20	Book Section	Multicultural
Spencer	1998	The global God: Multicultural evangelical views of God	231	Edited Book	Multicultural

Showing 7677 of 7677 references.

Year
1977

Title
Towards a planetary vision

Place Published
The Park Forrest, Scotland

Publisher
Findhorn Foundation

Short Title

ISBN

Read

Call Number

Keywords
New Age

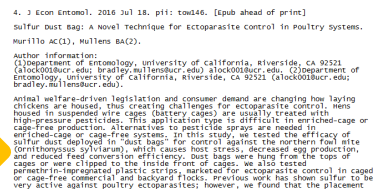
Abstract

Notes

URL

Image

Title and Abstract Screening



4. J Econ Entomol. 2016 Jul 18. pii: tow146. [Epub ahead of print]

Sulfur Dust Bag: A Novel Technique for Ectoparasite Control in Poultry Systems.

Murillo AC(1), Mullens BA(2).

Author information:
(1)Department of Entomology, University of California, Riverside, CA 92521 (alock001@ucr.edu; bradley.mullens@ucr.edu) alock001@ucr.edu. (2)Department of Entomology, University of California, Riverside, CA 92521 (alock001@ucr.edu; bradley.mullens@ucr.edu).

Animal welfare-driven legislation and consumer demand are changing how laying chickens are housed, thus creating challenges for ectoparasite control. Hens housed in suspended wire cages (battery cages) are usually treated with high-pressure pesticides. This application type is difficult in enriched-cage or cage-free production. Alternatives to pesticide sprays are needed in enriched-cage or cage-free systems. In this study, we tested the efficacy of sulfur dust deployed in 'dust bags' for control against the northern fowl mite (Ornithonyssus sylviarum), which causes host stress, decreased egg production, and reduced feed conversion efficiency. Dust bags were hung from the tops of cages or were clipped to the inside front of cages. We also tested permethrin-impregnated plastic strips, marketed for ectoparasite control in caged or cage-free commercial and backyard flocks. Previous work has shown sulfur to be very active against poultry ectoparasites; however, we found that the placement of bags was important for mite control. Sulfur in hanging bags reduced mites on treatment birds by 95 or 97% (depending on trial) within one week of being deployed, and mite counts on these birds were zero after 2 wk. Clipped sulfur bags acted more slowly and did not significantly reduce mites in one trial, but reduced mite counts to zero after 4 wk in trial 2. Permethrin strips had no effect on mite populations. This may have been due to mite resistance, even though this mite population had not been exposed to pyrethroids for several years. Sulfur bags should be effective in caged or cage-free systems.

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DOI: 10.1093/jee/tow146

Full Text Screening

Ecotoxicology 2, 93–120 (1993)

The impact of the Cyanamid Canada Co. discharges to benthic invertebrates in the Welland River in Niagara Falls, Canada

MIKE DICKMAN and GRAZYNA RYGIEL

Biological Sciences Department, Brock University, St. Catharines, Ontario, Canada L2S 3A1

Received 15 July 1992; accepted 6 December 1992

In 1986, the International Joint Commission (IJC) recommended that the Niagara River watershed should be declared an Area of Concern (AOC). This IJC recommendation was ratified by the 4 signatories of the Great Lakes Water Quality Agreement. In order to delist an AOC, it is necessary to locate any areas of impairment within the watershed and carry out remediation projects that permit uses that were previously impaired. To this end we attempted to determine whether or not the sediments at 7 study sites near the Cyanamid Canada (Chemical) Co. were contaminated at levels that would result in the impairment of the natural biota which inhabit the watershed.

The Cyanamid Canada (Chemical) Co. discharges ammonia wastes, cyanide, arsenic and a variety of heavy metals into treatment systems which ultimately discharge to the Welland River, the major Canadian tributary to the Niagara River. This portion of the Welland River near the factory was designated a Provincially significant (Class one) wetlands by the Ontario Ministry of Natural Resources. In 1986, the mean discharge to a creek from Cyanamid Canada Co. was 27,342 m^3 per day (MOE, 1987). Similar discharge volumes occurred in 1989. In 1991, the total discharge was 25,000 m^3 per day (MOE, 1991).

The majority of the benthic invertebrates collected from the study area were pollution tolerant taxa (e.g., sludge worms constituted 68% of all the organisms collected). The lowest chironomid densities were observed at stations 1, 2, and 4, which were the only stations situated close to Cyanamid's discharge pipes. The absence, of clams and mayflies which burrow to greater depths than do chironomids and sludge worms, probably reflects the inability of the deeper dwelling burrowers to tolerate the contaminants which we recorded at these 3 stations. The absence of all crustaceans from these same 3 stations (stations 1, 2 and 4) when coupled with their low biotic diversity and the elevated heavy metal concentrations in the sediments were cause for concern. In addition, stations 2 and 4 displayed the highest frequency of chironomid mentum deformities.

Stations 1 and 2 were located near a pipe which was one of Cyanamid Canada Company's major discharge point sources to the Welland River until a court order in 1980 stopped the company from discharging toxic material to the Welland River via that pipe. Elevated levels of cobalt (10 times above background), molybdenum (6 times above background), nickel (8 times above background), tungsten (284 times above background) and zinc (20 times above background) near the abandoned discharge pipe were correlated with the presence of pollution tolerant chironomid taxa such as *Polypedilum* and *Procladius*. The highest sludge worm densities were also observed at the abandoned pipe site which was the only site where oily wastes were found in the sediments.

Among the 1,275 chironomids taken from the seven Cyanamid Canada stations, the great majority were pollution tolerant taxa. The low biotic diversity and the presence of considerable numbers of pollution tolerant benthic macroinvertebrates in combination with the chemical

0963-9292 © 1993 Chapman & Hall

Applicability Requirements

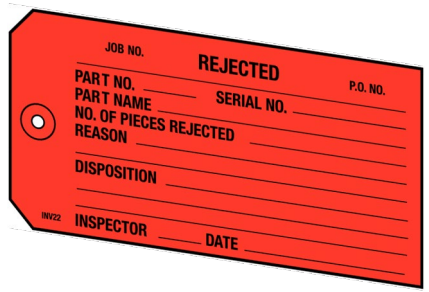
Identify and acquire potentially applicable studies → **Review literature for applicability**

	Key Area	Data Requirement
P (Population)	Species	• Taxonomically verifiable organisms (including cells, organs, gametes, embryos, plant cuttings) [NOT bacteria, humans, monkeys, viruses, or yeast]
E (Exposure)	Chemical	• Single, verifiable chemical toxicants, administered through an acceptable route.
	Exposure Amount (Concentration)	• Exposure amount is quantified, either as a concentration in the environment when administered via soil or water, or as a dosage when introduced directly into or on the organism, via injection, orally, or topically.
	Exposure Duration	• Known duration from the time of initial exposure to the time of measurement.
C (Comparator/ Control)	Control	• Must have a control treatment [a]
O (Outcome)	Effect	• Biological effect measured • Effect concurrent with associated chemical exposure
	Publication Type	• Primary source of the data • Study must be a full article in English [NOT: Review article or abstract citation only]

Exclusion Documentation

All Excluded and Non-Applicable studies are Tagged with the reason for rejection

- Abstract – published as an abstract
- Bacteria – only test organism is a bacteria
- CAS # Unavailable – could not verify/locate chemical CAS Registry number
- Chemical method – description of chemical analysis procedures
- Fate – only report chemical distribution in media
- Human Health – data on human subjects of surrogate animal subjects for human health risk assessment
- Incident – reports death of animal by poison, but does not provide concentration/duration of exposure
- Method – paper only reports methods for conducting a toxicity test or other aspect of an experiment
- Mixture – paper reports results from mixture of chemicals; no single chemical exposure results
- Modeling – results of the development of a model; no primary data available
- No Conc – the authors report a response in an organism but do not provide conc/dose/app rate
- No Duration – duration of exposure is not presented
- No Effect – paper does not report observed responses adverse of otherwise
- No Toxicant (ozone, CO2)
- Non-English
- Nutrient – in situ chemical tested as nutrient
- PUBL AS – duplicate data published elsewhere
- Retracted – paper retracted by Journal
- Review – primary data published elsewhere
- Sediment – only sediment concentration presented
- Survey – chemical measured in organism, but lack quantification of exposure (dose/duration)
- Virus – virus is only test organism
- Yeast – yeast is only test organism



ECOTOX Data Curation Pipeline

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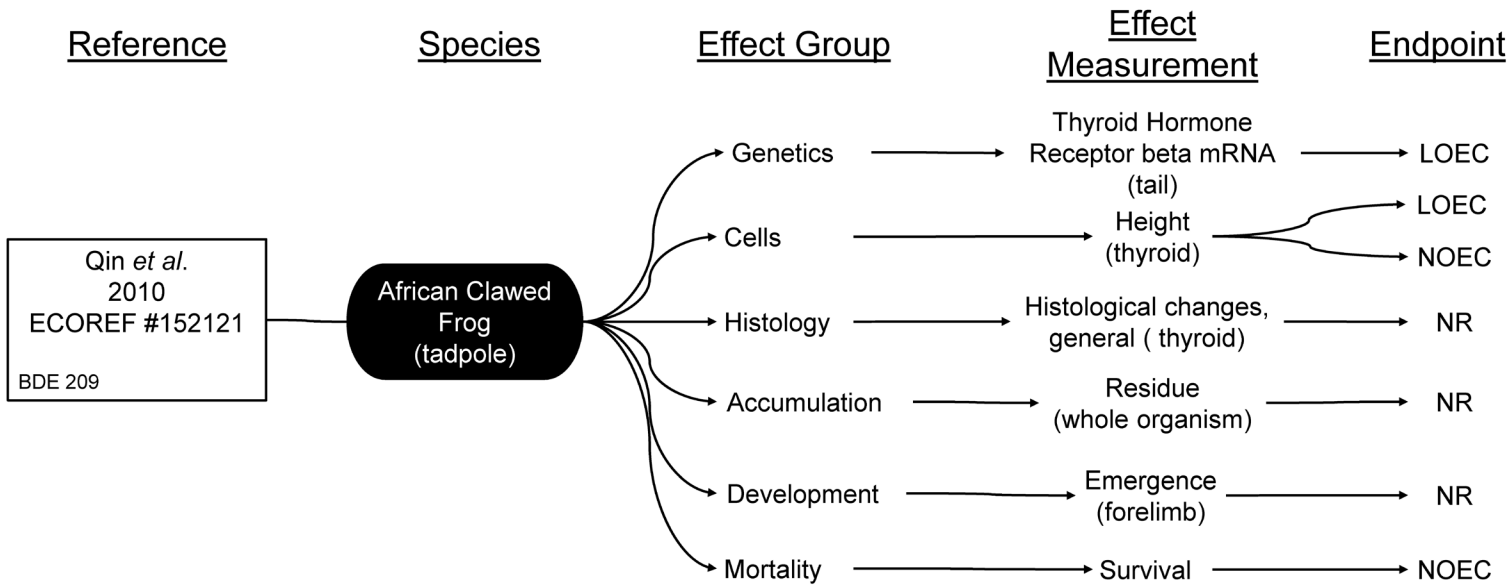
Thyroid disruption by technical decabromodiphenyl ether (DE-83R) at low concentrations in *Xenopus laevis*



NOEC = No Observed Effect Level LOEC = Lowest Observed Effect Level NR = Not Reported

ECOTOX Data Fields

Extract study and toxicity data

- Unique Identifiers
  - Chemical ID
    - CASRN
    - DTXSID
  - Taxonomic ID
    - NCBI TaxID
    - ITIS TSN

- Test Species
  - Species Group *
    - Animals
    - Plants
    - Special Interests
  - Life stage *
  - Gender *
  - Organism Source *

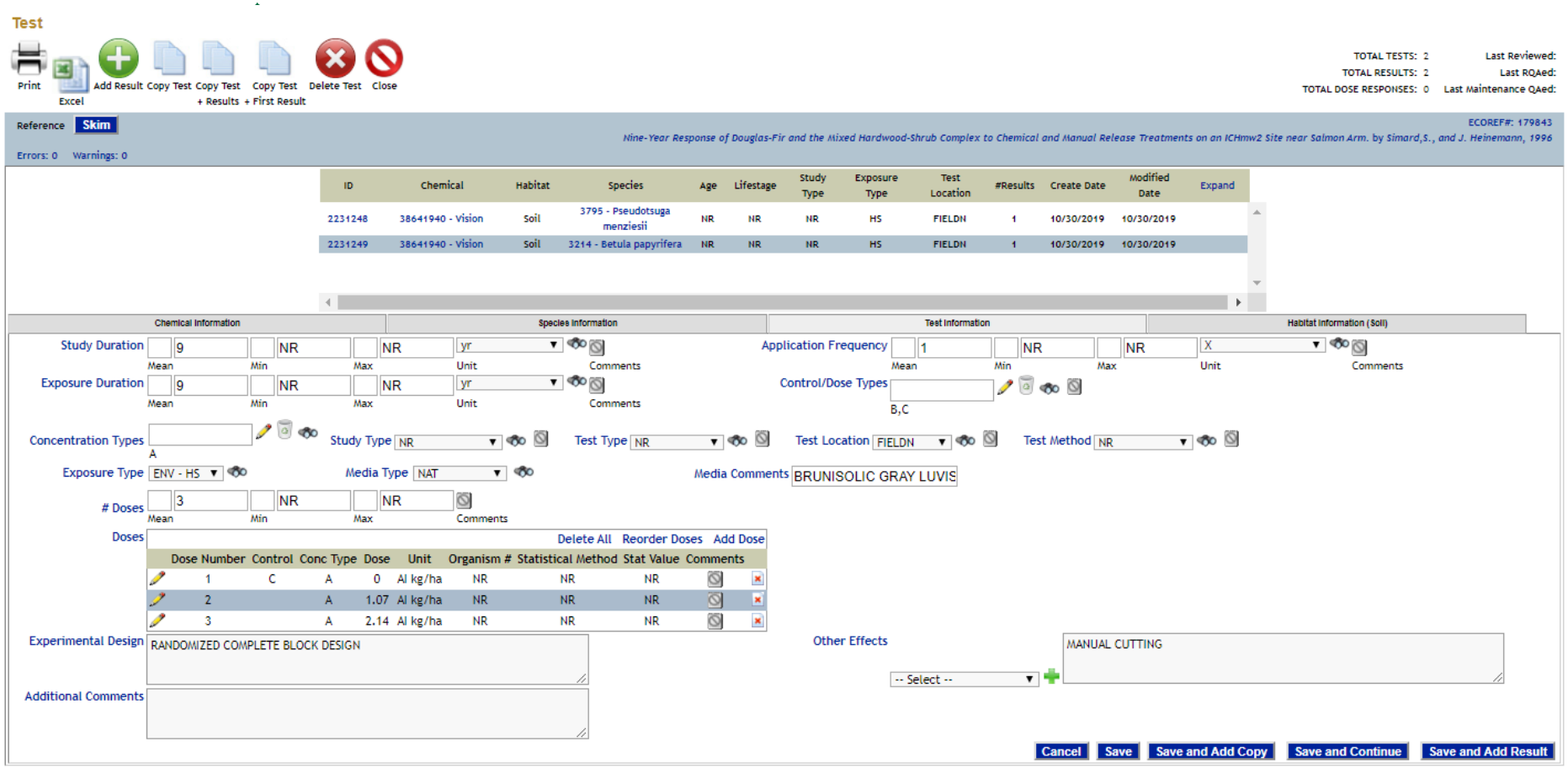
- Chemical
  - Chemical Analysis *
  - Chemical Formulation *
  - Chemical Grade *
  - Concentration Type *
  - Chemical Radiolabel *
  - Chemical Groups *
    - Organic Compounds
      - PCBs
      - EDCs
    - Metal/Organometal
      - Selenium
      - Copper

- Test Condition
  - Test Location *
    - Lab
    - Field
      - Sub-habitat *
      - Geographic Loc.
  - Exposure Type *
    - Diet
    - Injection
    - Flow-through (Aq.)
    - Renewal
  - Exposure Media *
    - Aquatic *
      - Freshwater
      - Salt water
    - Terrestrial *
      - Soil Type *
      - Organic Matter
    - Artificial
  - Study Duration
  - Exposure Duration
  - Control Type *

- Results
  - Response Site *
  - Endpoint *
    - Concentration-based *
      - LC/LDxx, EC/EDxx
      - NOEC/NOEL/LOEC/LOEL
    - Time-based *
      - LT/ETxx
      - BAF/BCF
  - Trend *
  - Effect *
    - Effect Group *
      - Effect Measurement *
        - Accumulation *
        - Behavior *
          - Avoidance
          - General Behavior
          - Feeding Behavior
        - Biochemistry *
          - Biochemical *
          - Enzyme *
          - Hormone *
        - Cellular *
          - Cellular *
          - Genetic *
          - Histological
      - Growth *
        - Growth *
        - Development *
        - Morphology *
      - Mortality *
      - Physiology *
        - General Phys. *
        - Injury *
        - Immunity *
        - Intoxication *
      - Reproduction *
      - Population *
      - Ecosystem *

* ECOTOX Vocabularies: https://cfpub.epa.gov/ecotox/help.cfm?sub=term-appendix

ECOTOX Data Fields



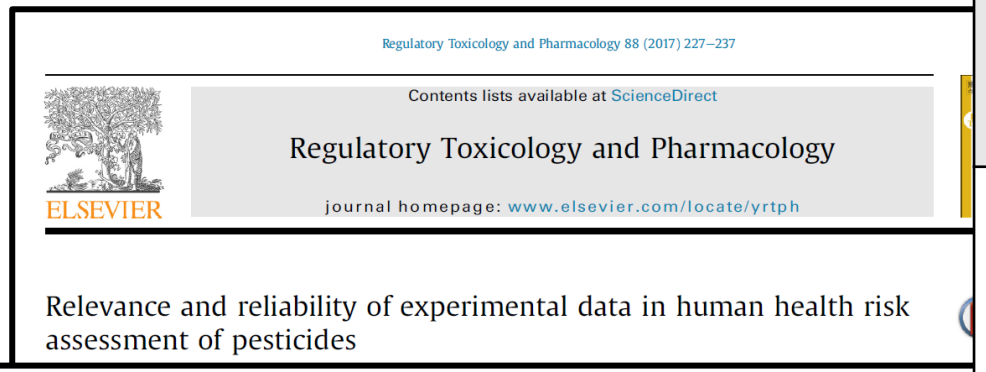
Extract study and toxicity data

GUI for data curation

- Up to 90 entities (300-400 data fields) per study
- Following controlled vocabularies
- Computationally assisted
- Consistent extraction

* ECOTOX Vocabularies:
https://cfpub.epa.gov/ecotox/help.cfm?sub=term-appendix

Informing Study Evaluation


Regulatory Toxicology and Pharmacology 88 (2017) 227–237

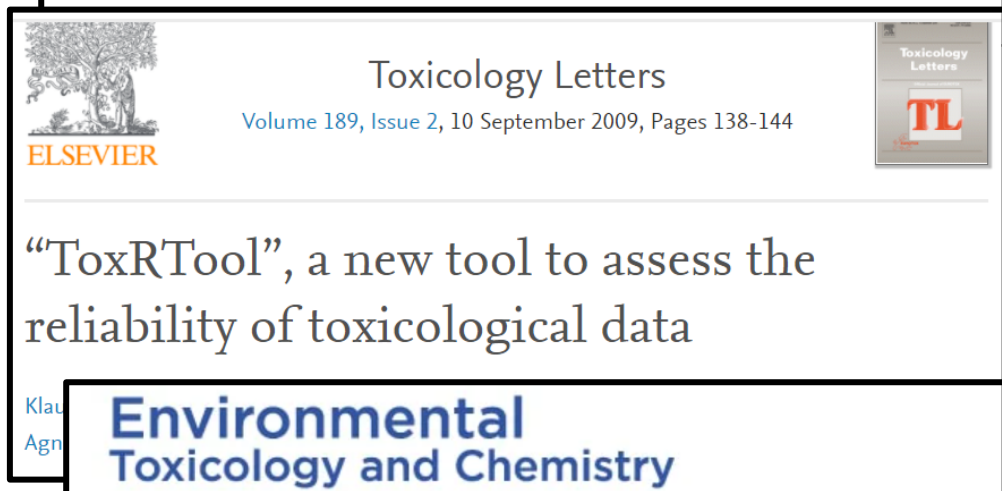
Contents lists available at ScienceDirect

Regulatory Toxicology and Pharmacology

journal homepage: www.elsevier.com/locate/yrtph

ELSEVIER

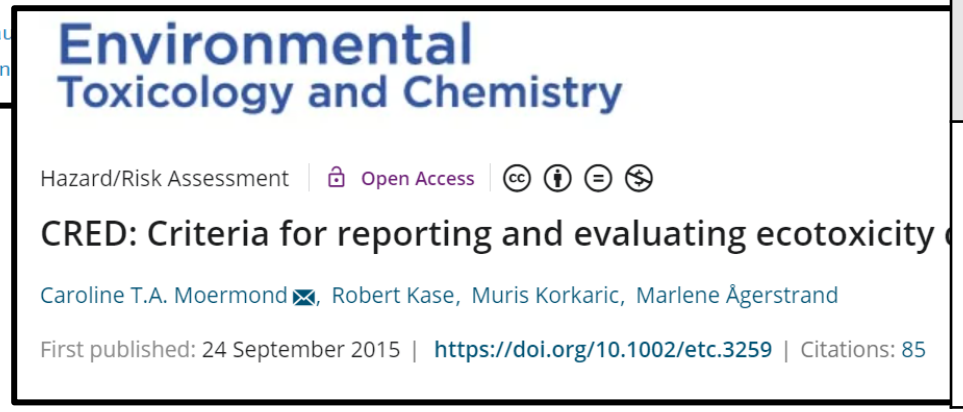
Relevance and reliability of experimental data in human health risk assessment of pesticides


Toxicology Letters

Volume 189, Issue 2, 10 September 2009, Pages 138-144

ELSEVIER

"ToxRTool", a new tool to assess the reliability of toxicological data


Environmental Toxicology and Chemistry

Hazard/Risk Assessment | Open Access

CRED: Criteria for reporting and evaluating ecotoxicity

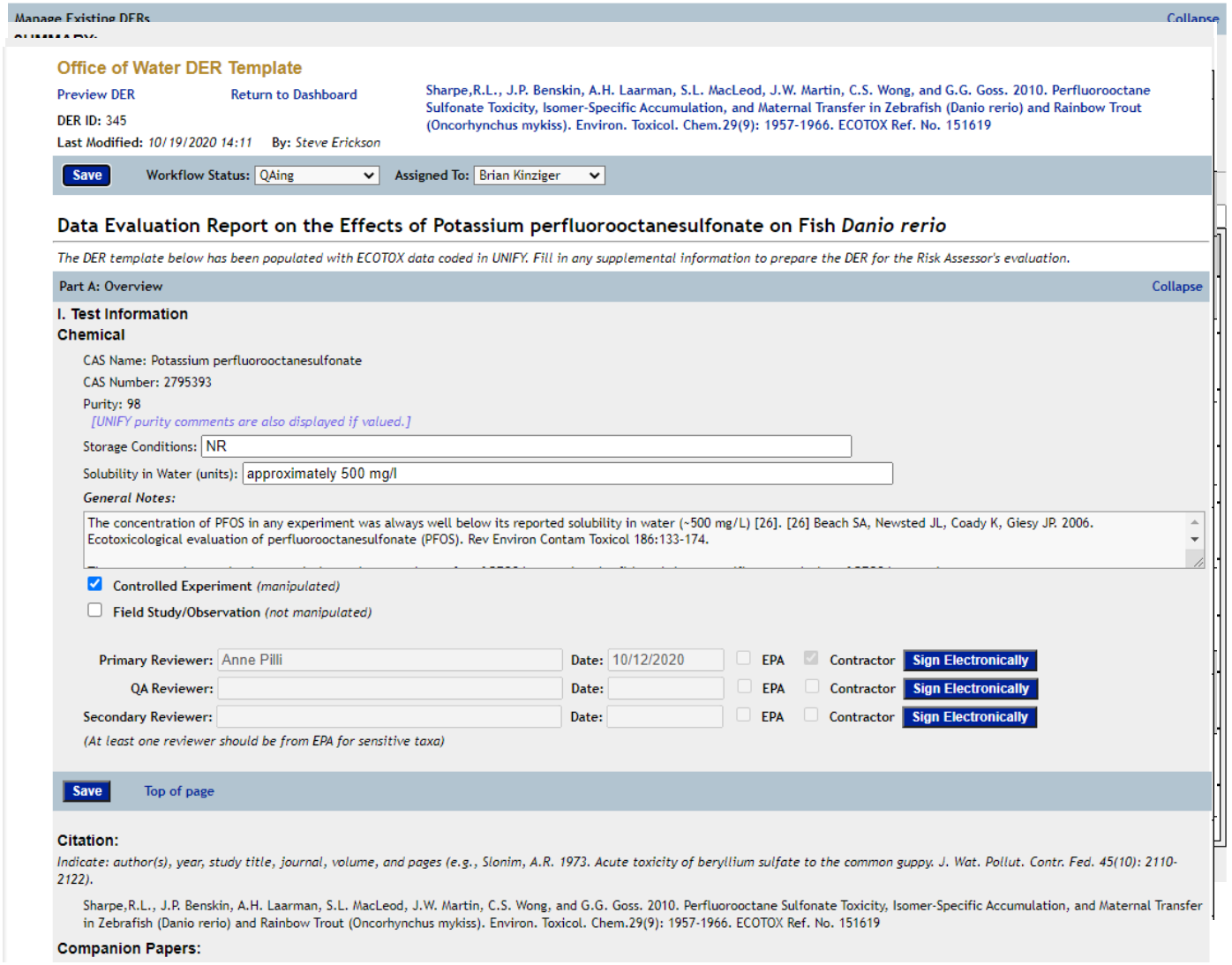
Caroline T.A. Moermond, Robert Kase, Muris Korkaric, Marlene Ågerstrand

First published: 24 September 2015 | https://doi.org/10.1002/etc.3259 | Citations: 85

Select study evaluation questions with relevant ECOTOX field(s)	
Chemical	• Is test substance identified? **Required for inclusion in ECOTOX** • Is the purity of test substance reported? **Chemical Purity** • Were chemical concentrations verified? **Chemical Analysis** (e.g., nominal versus measured concentrations)
Species	• Is the species given? **Verifiable species (Scientific Name, etc.) required for inclusion in ECOTOX** • Are the organisms well described? **Organism Source**, **Lifestage**, **Age**, **Gender**, **Initial** and **Final Weight**
Test Conditions	• Are appropriate controls performed? **A control is required for inclusion in ECOTOX**, type described in **Control** • Is a guideline method (e.g., OECD) used? **Test Method** • Are the experimental conditions appropriate and acceptable for the test substance and organism? **Test Method**, **Media Type**, **Test Location**, **Experimental Design**, Physical and Chemical Soil and Water Parameters (e.g., **pH**, **Temperature**, **Dissolved Oxygen**)
Test Results	• Are the reported effects and endpoints appropriate for the purpose, test substance and organism? **Effect Measurement**, **Endpoint** • Is the response/effect statistically significant? **Statistical Significance**, **Significance Level**

Developing Data Evaluation Tools

Collaboration with USEPA's Office of Water


Manage Existing DERs Collapse

Office of Water DER Template

Preview DER Return to Dashboard

DER ID: 345

Last Modified: 10/19/2020 14:11 By: Steve Erickson

Sharpe,R.L., J.P. Benskin, A.H. Laarman, S.L. MacLeod, J.W. Martin, C.S. Wong, and G.G. Goss. 2010. Perfluorooctane Sulfonate Toxicity, Isomer-Specific Accumulation, and Maternal Transfer in Zebrafish (Danio rerio) and Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.29(9): 1957-1966. ECOTOX Ref. No. 151619

Save Workflow Status: QAing Assigned To: Brian Kinziger

Data Evaluation Report on the Effects of Potassium perfluorooctanesulfonate on Fish *Danio rerio*

The DER template below has been populated with ECOTOX data coded in UNIFY. Fill in any supplemental information to prepare the DER for the Risk Assessor's evaluation.

Part A: Overview Collapse

I. Test Information

Chemical

CAS Name: Potassium perfluorooctanesulfonate

CAS Number: 2795393

Purity: 98

[UNIFY purity comments are also displayed if valued.]

Storage Conditions: NR

Solubility in Water (units): approximately 500 mg/l

General Notes:

The concentration of PFOS in any experiment was always well below its reported solubility in water (~500 mg/L) [26]. [26] Beach SA, Newsted JL, Coady K, Giesy JP. 2006. Ecotoxicological evaluation of perfluorooctanesulfonate (PFOS). Rev Environ Contam Toxicol 186:133-174.

☑ Controlled Experiment *(manipulated)*

☐ Field Study/Observation *(not manipulated)*

Primary Reviewer:	Anne Pilli	Date: 10/12/2020	☐ EPA	☑ Contractor	Sign Electronically
QA Reviewer:		Date:	☐ EPA	☐ Contractor	Sign Electronically
Secondary Reviewer:		Date:	☐ EPA	☐ Contractor	Sign Electronically

(At least one reviewer should be from EPA for sensitive taxa)

Save Top of page

Citation:

Indicate: author(s), year, study title, journal, volume, and pages (e.g., Slonim, A.R. 1973. Acute toxicity of beryllium sulfate to the common guppy. J. Wat. Pollut. Contr. Fed. 45(10): 2110-2122).

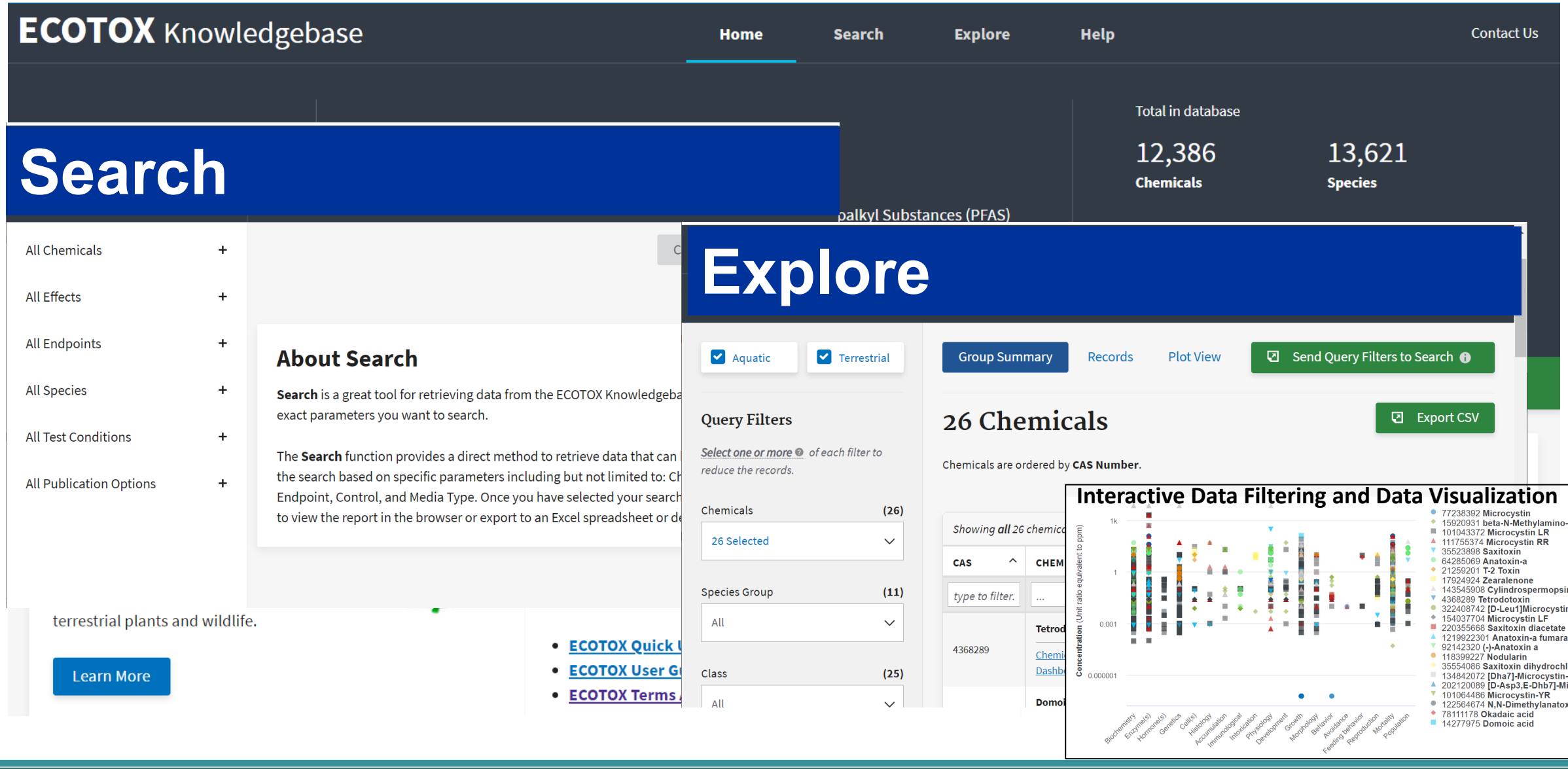
Sharpe,R.L., J.P. Benskin, A.H. Laarman, S.L. MacLeod, J.W. Martin, C.S. Wong, and G.G. Goss. 2010. Perfluorooctane Sulfonate Toxicity, Isomer-Specific Accumulation, and Maternal Transfer in Zebrafish (Danio rerio) and Rainbow Trout (Oncorhynchus mykiss). Environ. Toxicol. Chem.29(9): 1957-1966. ECOTOX Ref. No. 151619

Companion Papers:

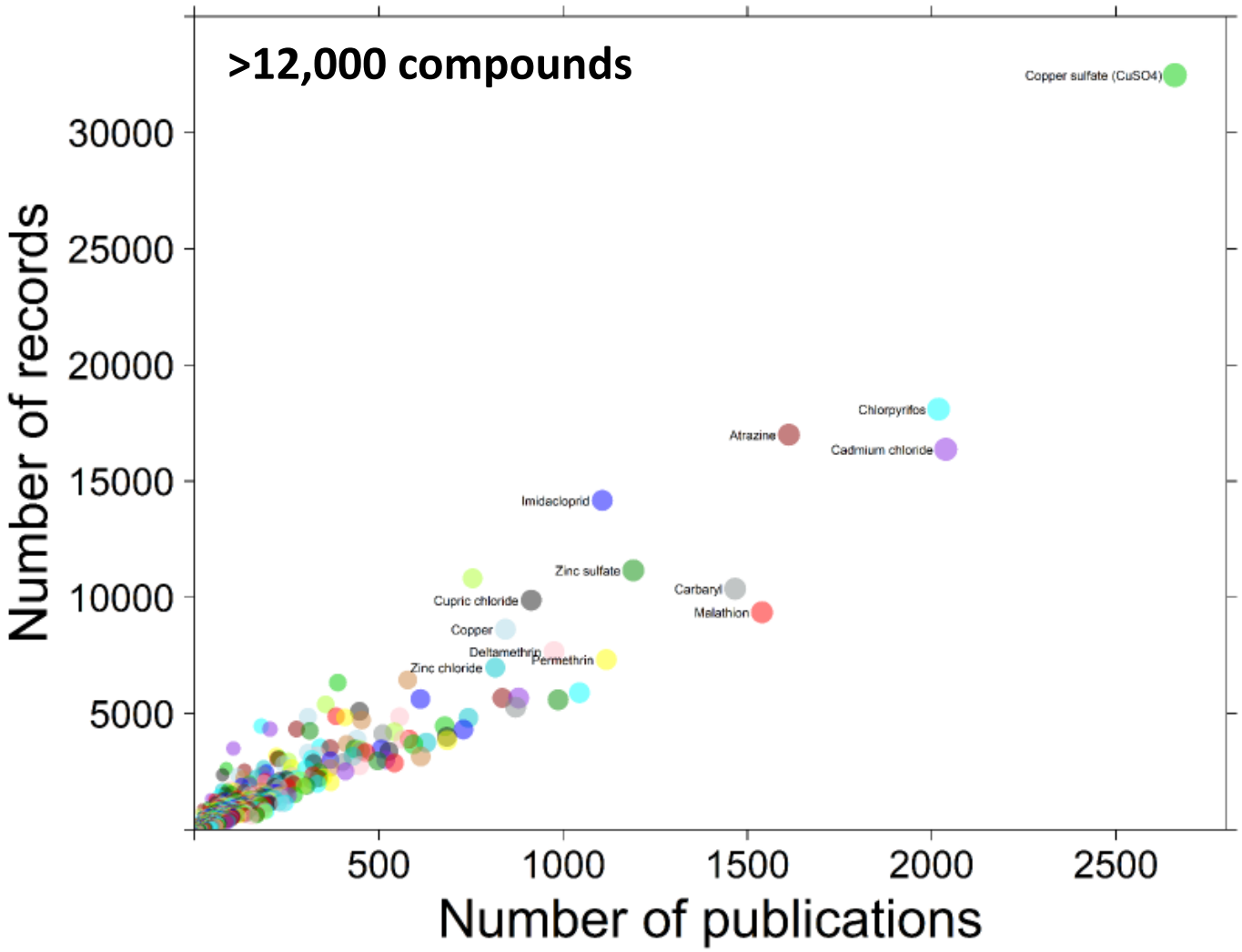
- Application pulls objective data extracted from existing records
- UNIFY platform now has ability for curators to add subjective observations
- Allows multiple reviewers
  - Primary
  - QA
  - Secondary

ECOTOX Version 5

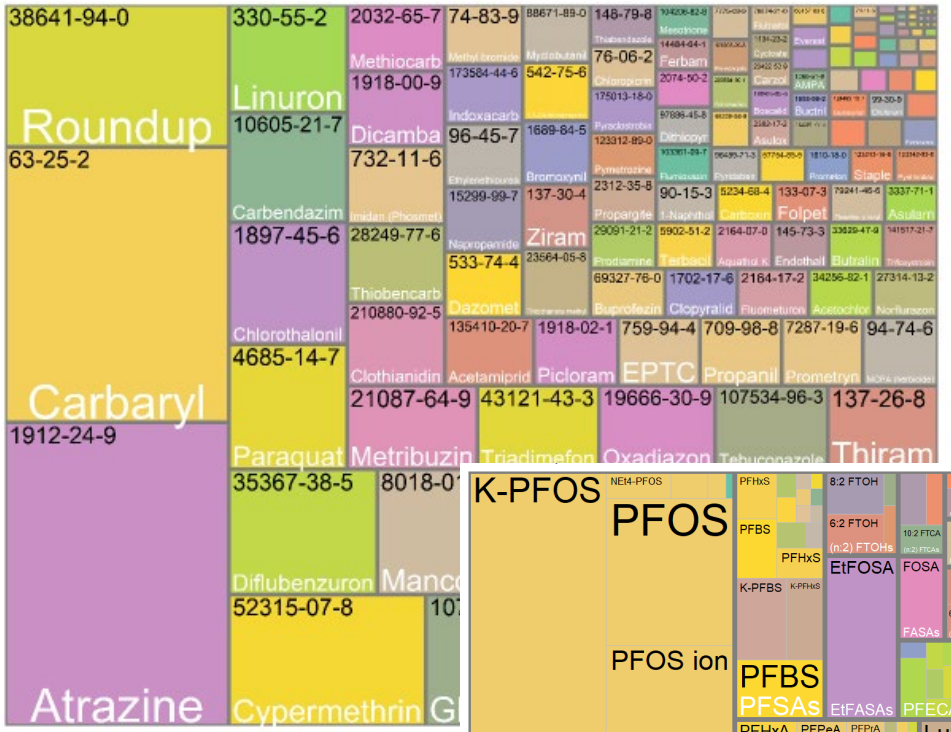
www.epa.gov/ecotox



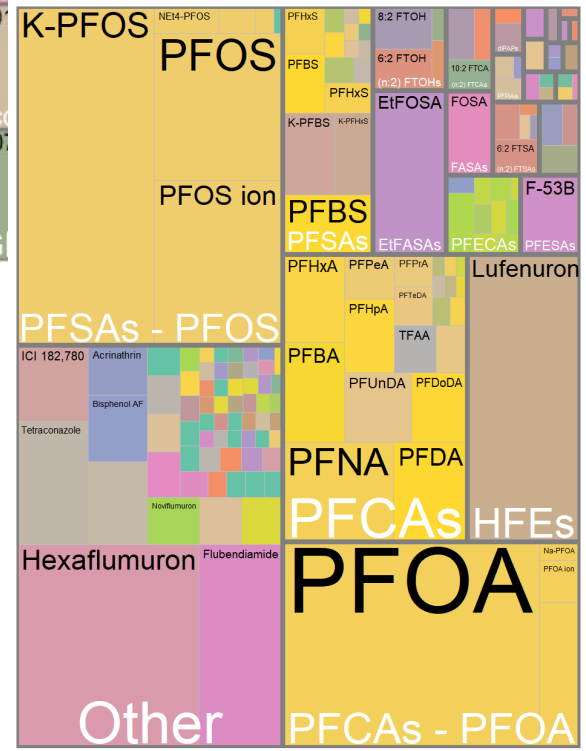
Chemicals



Pesticides

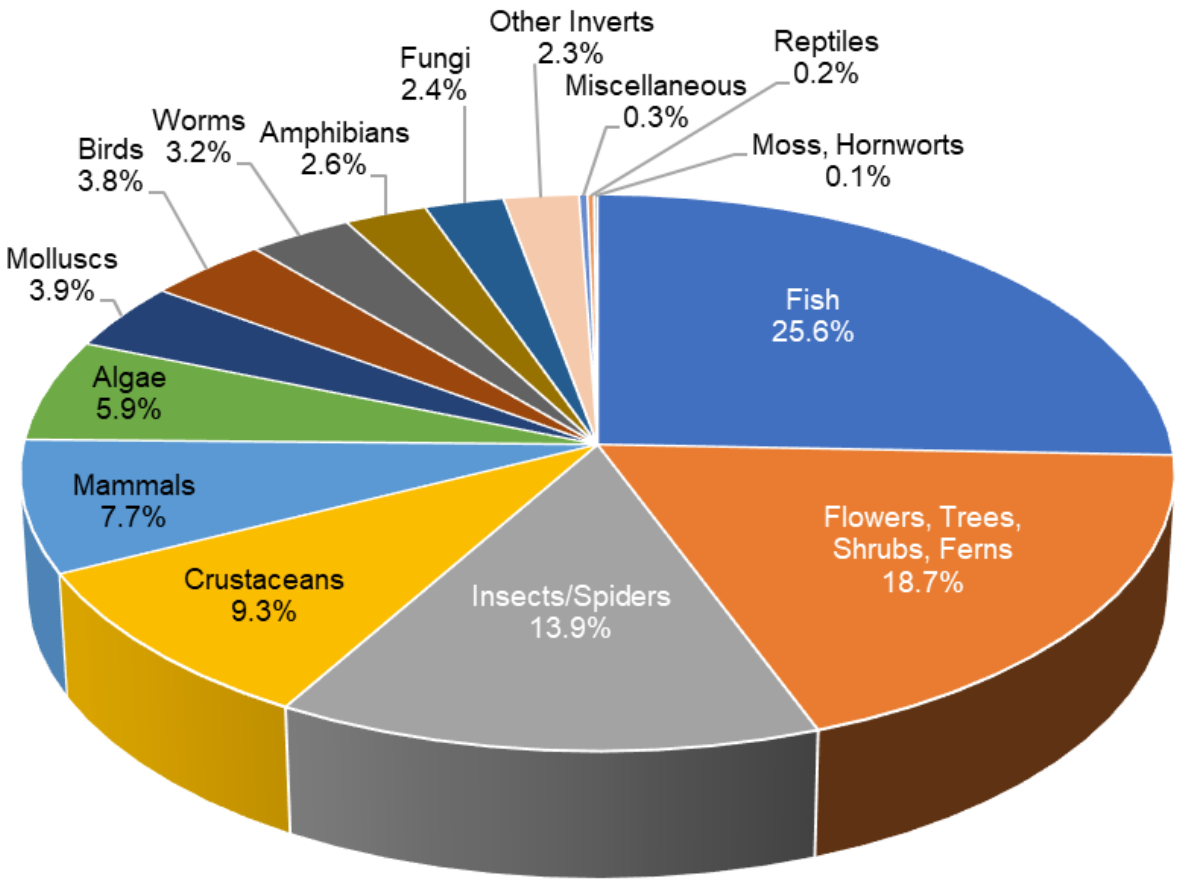


PFAS

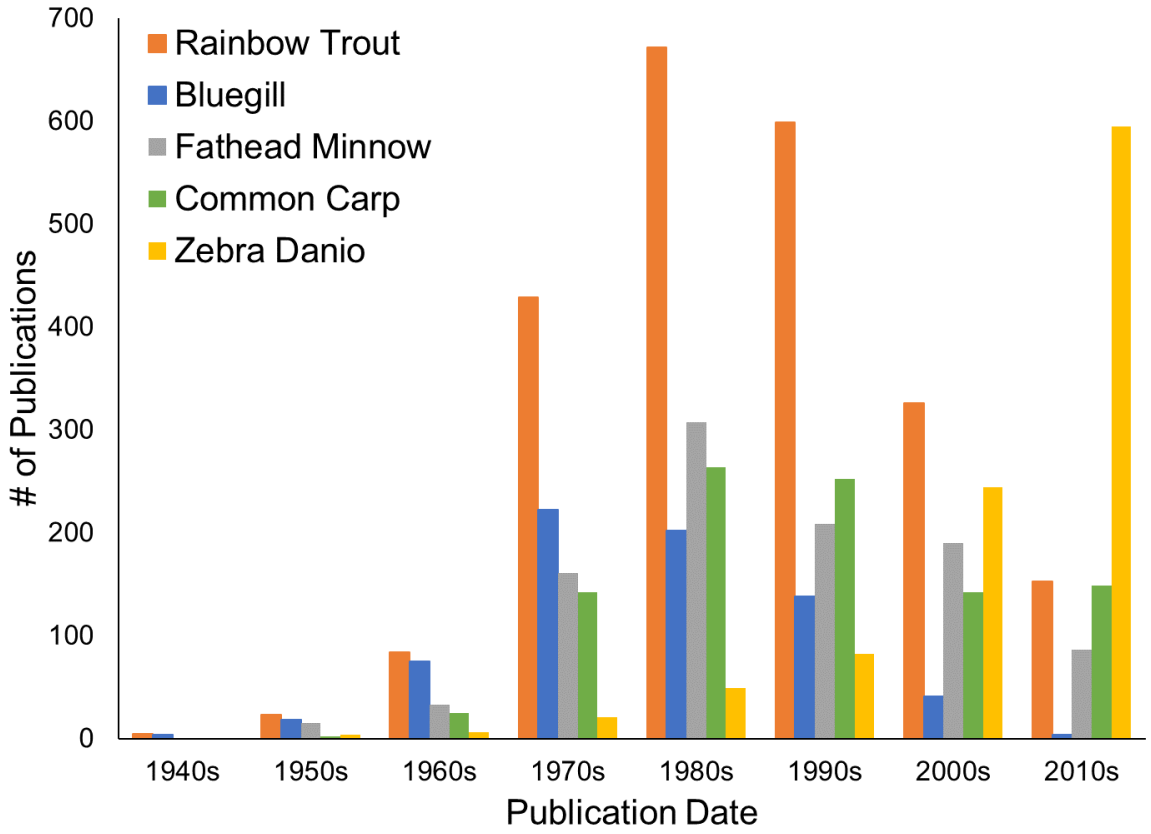


Species (n = 13,621)

% of Records by Species Group (Sept 2021)

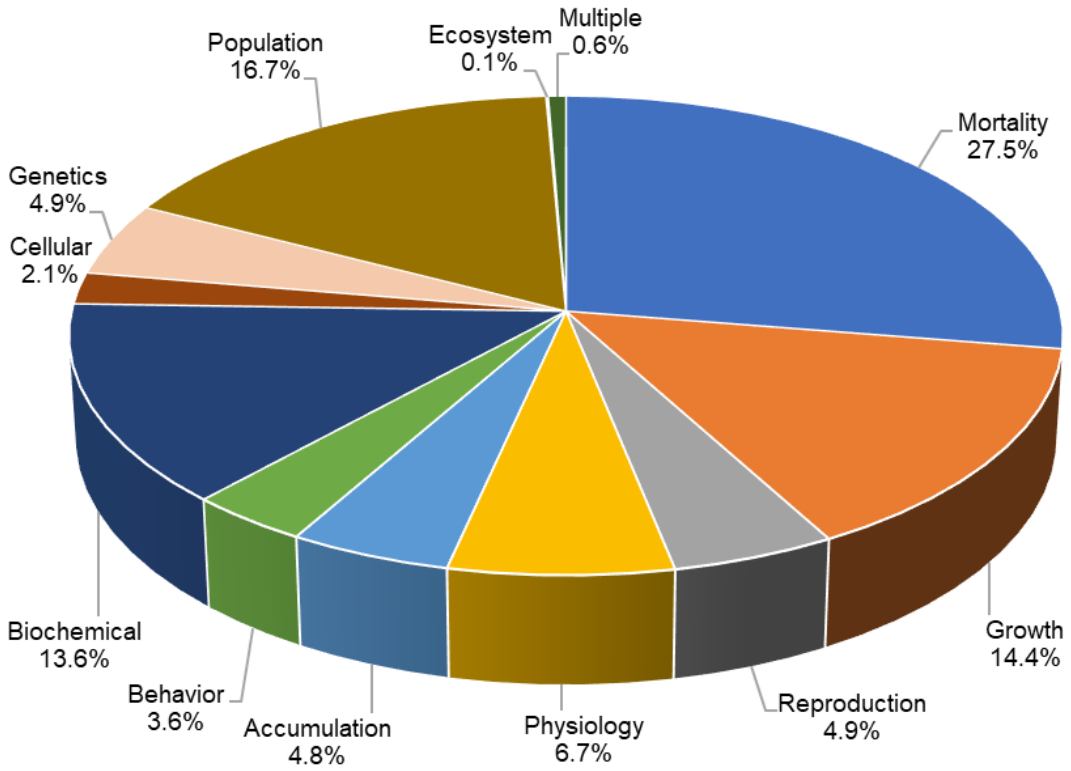


Decadal Shifts in Test Species

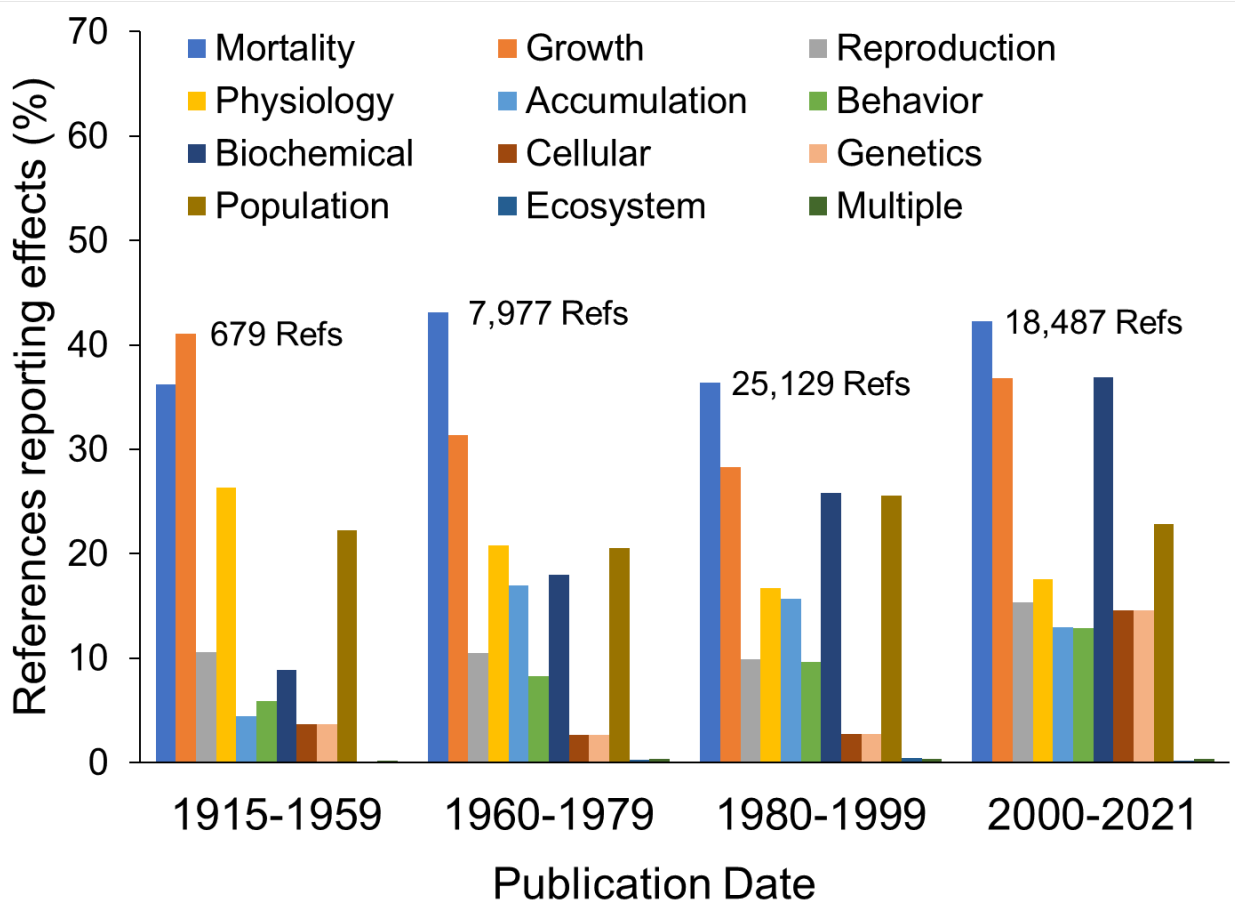


Diversity of Effects

% of Records by Effect Group (Sept 2021)



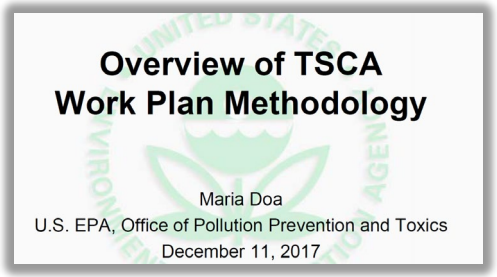
Increases in Biochemical and Genetic Effects Reported



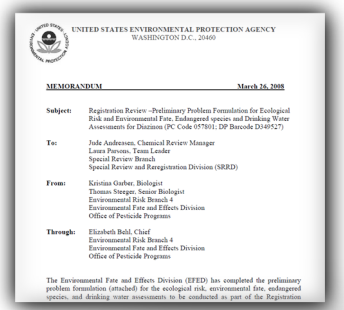
Applications

Chemical environmental toxicity data for aquatic life, terrestrial plants and wildlife

Provides data to



EPA Program Offices and Regions, States, Tribes, Other Federal Agencies and International Entities


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D.C., 20460

MEMORANDUM March 26, 2008

Subject: Registration Review –Preliminary Problem Formulation for Ecological Risk and Environmental Fate, Endangered species and Drinking Water Assessments for Diazinon (PC Code 057801; DP Barcode D349527)

To: Jude Andreasen, Chemical Review Manager
Laura Parsons, Team Leader
Special Review Branch
Special Review and Reregistration Division (SRRD)

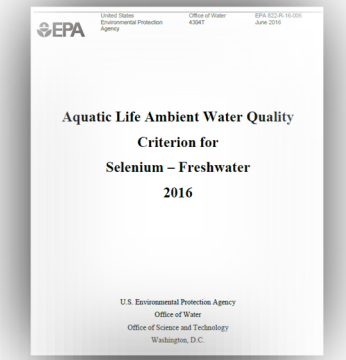
From: Kristina Garber, Biologist
Thomas Steeger, Senior Biologist
Environmental Risk Branch 4
Environmental Fate and Effects Division
Office of Pesticide Programs

Through: Elizabeth Behl, Chief
Environmental Risk Branch 4
Environmental Fate and Effects Division
Office of Pesticide Programs

The Environmental Fate and Effects Division (EFED) has completed the preliminary problem formulation (attached) for the ecological risk, environmental fate, endangered species, and drinking water assessments to be conducted as part of the Registration

Ecological Risk Assessment for Office of Pesticides for chemical registration and re-registration (FY20 – 27 chemicals).

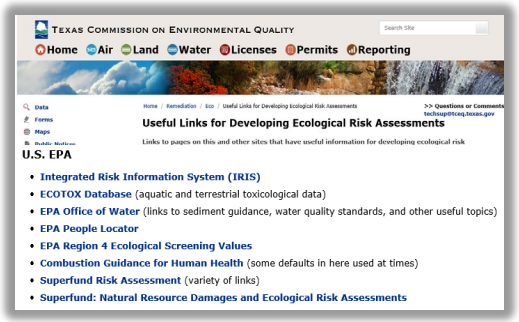
Ambient Water Quality Criteria for Aquatic Life


EPA
United States Environmental Protection Agency
Office of Water 4304T
EPA 822-R-16-006 June 2016

Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016

U.S. Environmental Protection Agency
Office of Water
Office of Science and Technology
Washington, D.C.

Ecological hazard data for the Prioritization and Assessment of Chemicals for TSCA/Lautenberg Act.

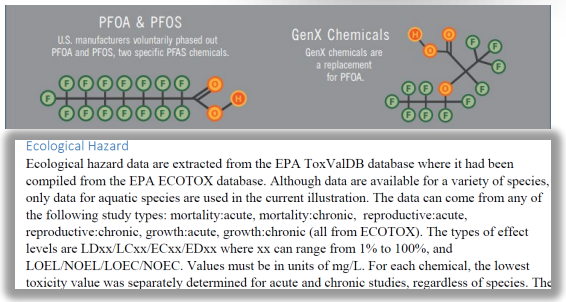

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Home Air Land Water Licenses Permits Reporting

Useful Links for Developing Ecological Risk Assessments

U.S. EPA

- Integrated Risk Information System (IRIS)
- ECOTOX Database (aquatic and terrestrial toxicological data)
- EPA Office of Water (links to sediment guidance, water quality standards, and other useful topics)
- EPA People Locator
- EPA Region 4 Ecological Screening Values
- Combustion Guidance for Human Health (some defaults in here used at times)
- Superfund Risk Assessment (variety of links)
- Superfund: Natural Resource Damages and Ecological Risk Assessments

Ecological Site Assessments and in Emergency Response by Office of Land and Emergency Management (Superfund and ORCR), HQ, Regions and States.


PFOA & PFOS
U.S. manufacturers voluntarily phased out PFOA and PFOS, two specific PFAS chemicals.

GenX Chemicals
GenX chemicals are a replacement for PFOA.

Ecological Hazard

Ecological hazard data are extracted from the EPA ToxValDB database where it had been compiled from the EPA ECOTOX database. Although data are available for a variety of species, only data for aquatic species are used in the current illustration. The data can come from any of the following study types: mortality:acute, mortality:chronic, reproductive:acute, reproductive:chronic, growth:acute, growth:chronic (all from ECOTOX). The types of effect levels are LDxx/LCxx/ECxx/EDxx where xx can range from 1% to 100%, and LOEL/NOEL/LOEC/NOEC. Values must be in units of mg/L. For each chemical, the lowest toxicity value was separately determined for acute and chronic studies, regardless of species. The

Ecological toxicity data for PFAS to researchers, EPA Eco Risk Assessment Forum, DoD Tri-Services ERA Work Group and others.

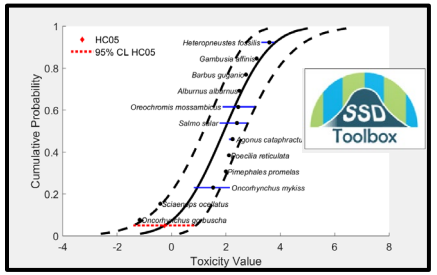
Applications

Chemical environmental toxicity data for aquatic life, terrestrial plants and wildlife

Provides data to

Data used for

EPA Program Offices and Regions, States, Tribes, Other Federal Agencies and International Entities



https://doi.org/10.23645/epacomptox.11971392

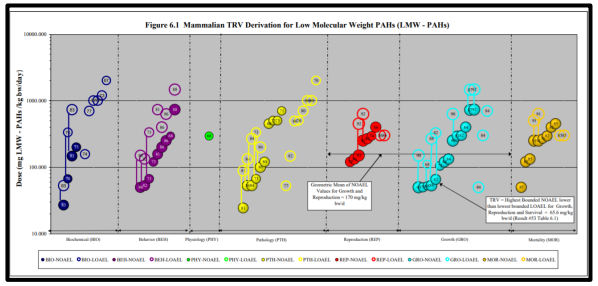
Tools and Applications

Toxicity Reference Values (TRVs) and Benchmarks

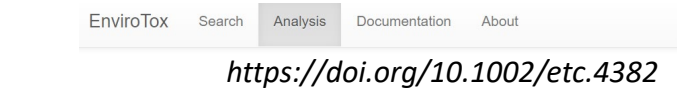
Species Sensitivity Distributions (e.g., US EPA's SSD Toolbox, Endangered species analyses, U.S. EPA's WebICE, NOAA's CAFE)

Predicted No Effect Concentrations (PNECs) and Eco-TTCs (e.g., EnviroTox, NORMAN)

Quantitative Structure-Activity Relationships and other models

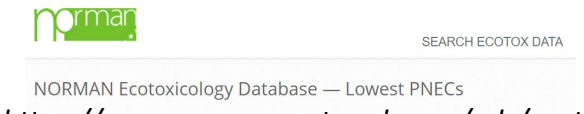


https://www.epa.gov/chemical-research/interim-ecological-soil-screening-level-documents



https://doi.org/10.1002/etc.4382

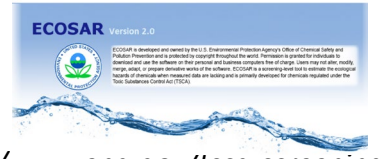
PNEC Derivation and EcoTTC Analysis; CTD Analysis



https://www.norman-network.com/nds/ecotox

QSAR TOOLBOX

https://qsartoolbox.org



https://www.epa.gov/tsca-screening-tools/ecological-structure-activity-relationships-ecosar-predictive-model

T.E.S.T. (Toxicity Estimation Software Tool)

https://www.epa.gov/chemical-research/toxicity-estimation-software-tool-test

Linking environmental contaminant concentrations to potential effects

Identify data gaps, Inform study design, Compare to new toxicity studies

Adverse Outcome Pathway (AOP) development

Applications

Chemical environmental toxicity data for aquatic life, terrestrial plants and wildlife

ECOTOX KNOWLEDGEBASE

Provides data to

Data used for

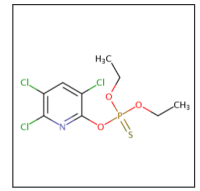
Data linked to

EPA Program Offices and Regions, States, Tribes, Other Federal Agencies and International Entities

Tools and Applications

Databases/Resources

U.S. EPA CompTox Chemicals Dashboard
(https://comptox.epa.gov/dashboard/)

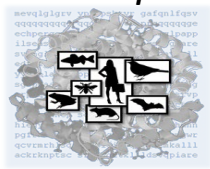


OECD eChemPortal
(https://www.echemportal.org/echemportal/

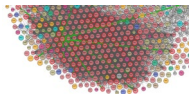
*Adverse Outcome Pathway Wiki**
(https://aopwiki.org/)

Adverse Outcome Pathway WIKI

*Sequence Alignment to Predict Across Species Susceptibility (SeqAPASS)**
(https://doi.org/10.1093/toxsci/kfw119)



*Biological Ontologies**



https://lod-cloud.net/

http://www.obofoundry.org/

*Pathways and Disease Databases**

KEGG reactome OMIM

*Health & Environmental Research Online (HERO)**
(https://hero.epa.gov/)

**Future*

Summary

- Systematic and transparent procedures to identify and curate ecological toxicity data
- 30 year plus history, with major recent updates and evolution in the near future
  - Maintain comprehensive and quality review of toxicity data
  - Enhance ease of data access and clarity
  - Meet the demands for increased pace of chemical assessments
  - Expand to reflect shifts in toxicity testing paradigm
- Curated data on public website (www.epa.gov/ecotox), readily available for exploration, querying, and export for risk assessments, risk management and research

Acknowledgements and Contact Info

Jennifer Olker
ECOTOX Coordinator
Great Lakes Toxicology and Ecology Division
US EPA ORD Center for Computational Toxicology and Exposure
Olker.Jennifer@epa.gov

Dale Hoff, GLTED Division Director

Colleen Elonen, SCDCD (previous ECOTOX coordinator)

Contract staff:

General Dynamics Information Technology (GDIT)
SpecPro Professional Services (SPS)

Senior Environmental Employment (SEE) staff

www.epa.gov/ecotox

ECOTOX Support:

218-529-5225

ecotox.support@epa.gov